

REMARKS

Reconsideration and allowance of the subject application are respectfully requested. By this Amendment, Applicant has canceled claim 3 without prejudice or disclaimer and added new claim 8. Thus, claims 1, 2 and 4-8 are now pending in the application. In response to the Office Action (Paper No. 6), Applicant respectfully submits that the pending claims define patentable subject matter.

I. The Present Invention

The present invention is directed to a reflection type liquid-crystal display apparatus having a light source in the system in which light is led in from a direction of the thickness of the apparatus. As shown in Figure 1, a reflection plate 6 is provided on the lower surface of a lower substrate 53. A lower transparent electrode (not shown) is provided on the upper surface of the lower substrate 53. An upper transparent electrode (not shown) is formed on the lower surface of an upper transparent substrate 51. A liquid crystal 52 interposed between the lower and upper transparent electrodes opposite to each other and surrounded by a seal 54. A polarizer 4 and a light guide film 2 are provided successively on the upper transparent substrate 51 through adhesive layers.

An illuminator includes a light source 11, and a reflection sheet (reflector) 12. The light source 11 is disposed along a side end surface of the upper transparent substrate 51 so that illumination light is made incident on the side end surface of the upper transparent substrate 51. The reflection sheet 12 is disposed to envelop the light source 11 so that light generated by the

light source 11 can enter the upper transparent substrate 51 efficiently. The end portion of the upper transparent substrate 51 on which illumination light is incident is protruded more than a corresponding end portion of the lower substrate 53 to thereby form a protruded end portion. The light source 11 is disposed along the protruded end portion. Opposite end portions of the reflection sheet 12 disposed so as to cover the light source 11 are attached closely to upper and lower surfaces in the protruded end portion of the upper transparent substrate 51 to thereby prevent light leakage.

A reflection sheet 3 is disposed onto at least one (preferably three) of the end surfaces except the end surface on which the light source 11 is disposed, so that the end surface(s) is (are) covered with the reflection sheet 3.

As shown in Figure 2 (a second embodiment of the invention), a reflection sheet 3 is stuck to an inner surface of a frame 7 through an adhesive agent. The liquid-crystal display device 8 is inserted in the frame 7 in such a direction that the light source 11 is protruded more than the frame 7. The liquid-crystal display device 8 is fixed by a transparent adhesive agent, or a transparent adhesive agent.

II. Prior Art Rejections

A. Disclosure of Bao

Bao discloses a reflective display device including a panel, a light guide plate and a light source. As shown in Figure 1, the panel 0 is provided with a transparent first substrate 1 lying on the side of the light source 30, a second substrate 2 joined to the first substrate 1 with a

predetermined gap therebetween and lying on the reflection side, a guest-host liquid crystal layer 3 held in the gap between the substrates 1 and 2, and electrodes 10 and 11 provided on each substrate 1 and 2 for applying a voltage to the guest-host liquid crystal layer 3. The light guide plate 20 is composed of a transparent material and is arranged on the outside of the first substrate 1. The light source 30 is arranged on the end of the light guide plate 20 and generates illumination light as required. The panel 0 further includes a reflecting layer 8 disposed on the side of the second substrate 2 for scattering and reflecting external light and a quarter-wavelength layer 9 provided between the guest-host liquid crystal layer 3 and the reflecting layer 8. The light guide plate 20 normally transmits external light onto the first substrate 1 and emits the external light reflected from the second substrate 2, and also, as required, guides illumination light onto the first substrate 1 and emits the illumination light reflected from the second substrate 2.

B. Disclosure of Mashino

Mashino discloses a liquid crystal display device having a side edge type back light system with a hue layer in the vicinity of the light source. As shown in Figure 1, the liquid crystal display (LCD) device includes a LCD panel 62, a light guide 37 placed under the LCD panel 62, a fluorescent tube 36 placed close to and along at least one side of the light guide 37, a lamp reflector sheet 66 for covering substantially the whole length of the fluorescent tube 36, a diffusion sheet 39 placed on the light guide 37 under the LCD panel, 62 and a reflective sheet 38 placed under the light guide 37. The surface of the lamp reflector sheet 66, reflective sheet 38 or

the diffusion sheet 39 on the one side of the light guide 37 is printed in color. A reflective tape 73 is bonded on the edge face 72 opposite the light-receiving edge face 65 by an adhesive layer.

C. Disclosure of Mamiya

Mamiya discloses a liquid crystal display unit including a back light which uses a light guiding sheet to transfer to a liquid crystal display panel the light from a light source. As shown in Figure 9, a liquid crystal display panel 100 includes an array-side glass substrate 120 and a cell-side glass substrate 122 opposed to the array-side glass substrate 120 at a predetermined cell gap, wherein between the array-side glass substrate 120 and the cell-side glass substrate 122 a liquid crystal 130 is enclosed. A light guiding sheet 1 is attached to the surface (hereinafter referred to as a back surface) of the array-side glass substrate 120 opposite to the cell-side glass substrate 122. The light guiding sheet 1 is formed by stacking two or more kinds of transparent amorphous layers different in refractive index at a predetermined angle with respect to a sheet surface.

A light source 114 is disposed on an end face of the array-side glass substrate 120 and the light guiding sheet 1 wherein the thickness of the light guiding sheet is such that a great part of the light of a light source 114 is directly incident from the end face of the light guiding sheet 1 and there is no necessity of utilizing a glass substrate 120 as a light guiding body. A reflecting plate 124 is attached to the other end through a $\lambda/4$ plate 126. A polarizing plate 116 is attached to the back surface of the light guiding sheet 1 and a light reflecting plate 108 is attached to the back surface of the polarizing plate 116. Light propagates through the light guiding sheet 1,

passes through the polarizing plate 116, is reflected by the reflecting plate 108, and is emitted toward the glass substrate 120.

D. Disclosure of Sanai

Sanai is directed to a surface lighting apparatus for backlighting a LCD panel 4 including a light guide 11 for evenly illuminating back face of the LCD. A reflecting frame 12 is disposed with its reflective inner walls closely around the light guide 11. The reflecting frame 12 made of a material of good light reflection, e.g. an aluminum plate is fixed on the printed substrate 8 by soldering or bonding of projections 12a, 12a thereto. Upside ends 12b, 12c of the reflecting frame 12 are formed in a trapezoid shape like a roof to cover the incandescent lamps 9 and 10 for reflecting the light beams emitted from incandescent lamps 9, 10, respectively.

E. Analysis

Claims 1 and 2 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Bao et al. (U.S. Patent No. 6,266,108; hereafter "Bao") in view of Mashino et al. (U.S. Patent No. 5,886,759; hereafter "Mashino"). Claims 3 and 7 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Bao in view of Mashino and Mamiya et al. (U.S. Patent No. 5,764,332; hereafter "Mamiya"). Claims 4-6 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Bao in view of Mashino and Sanai et al. (U.S. Patent No. 5,029,045; hereafter "Sanai"). Applicant respectfully submits that the claimed invention would not have been rendered obvious in view of the cited references.

AMENDMENT UNDER 37 C.F.R. § 1.111
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By this Amendment, Applicant has amended independent claim 1 to incorporate the subject matter of dependent claim 3. That is, claim 1 now recites “an end portion of said upper substrate is protruded more than a corresponding end portion of said lower substrate so that said light source is disposed on said protruded end surface of said upper substrate.” Applicant respectfully submits the cited references, alone or in combination, do not teach or suggest this feature of the claimed invention.

In the Office Action (pages 3 and 4), the Examiner contends that Mamiya discloses these features previously recited in claim 3 via the cell-side substrate 122 shown in Figure 9. However, as discussed above, Mamiya discloses the liquid crystal display panel 100 includes the array-side glass substrate 120, the cell-side glass substrate 122 opposed to the array-side glass substrate 120 at a predetermined cell gap, and the liquid crystal 130 (not shown in Figure 9) enclosed between the array-side glass substrate 120 and the cell-side glass substrate 122. Accordingly, the cell-side substrate 122 (which protrudes more than the array-side substrate 120) corresponds to the claimed lower substrate and the array-side substrate 120 corresponds to the claimed upper substrate.¹ Thus, Mamiya teaches that an end portion of the lower (cell-side) substrate protrudes more than a corresponding end portion of the upper (array-side) substrate so

¹ Claim 1 requires “a liquid-crystal display device including a lower substrate provided with a reflection plate, an upper substrate provided with a transparent film on which a light-reflecting element is provided for reflecting transmitted light toward the lower substrate side, and liquid crystal held between said lower substrate and said upper substrate, said light source being disposed at an end surface of said upper substrate, said liquid-crystal display device being configured so that light incident onto a surface of said upper substrate opposite to a contact surface of said upper substrate with said liquid crystal is reflected by said reflection plate of said lower substrate so as to exit from said surface of said upper substrate opposite to said contact surface of said upper substrate with said liquid crystal”.

that the light source is disposed on the protruded end surface of the lower (cell-side) substrate. On the other hand, claim 1 requires an end portion of the upper substrate is protruded more than a corresponding end portion of the lower substrate so that said light source is disposed on the protruded end surface of the upper substrate.

Accordingly, Applicant respectfully submits that independent claim 1, as well as dependent claims 2 and 4-7, should be allowable because the cited references, alone or in combination, do not teach or suggest all of the features of the claims.

By this Amendment, Applicant has added new dependent claim 8 to further define the claimed invention. Applicant respectfully submits that claim 8 should be allowable at least for the same reasons discussed above with regards to claim 1. Further, Applicant respectfully submits the cited references do not teach or suggest that an end portion of the polarizer is protruded more than a corresponding end portion of the lower substrate so that the light source is disposed on the protruded end surfaces of the upper substrate and the polarizer, as claimed.

III. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

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The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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